

CLAIMS

## WHAT IS CLAIMED IS:

- 5           1.     Polyurethane or polyurethane-urea comprised of  
poly(trimethylene-ethylene ether) glycol as a soft segment.
2.     The polyurethane or polyurethane-urea of claim 1, wherein  
the poly(trimethylene-ethylene ether) glycol has a number average  
10       molecular weight (Mn) of 250 to about 10,000.
3.     The polyurethane or polyurethane-urea of claim 1,  
comprising about 10 to about 90% soft segment.
- 15          4.     The polyurethane or polyurethane-urea of claim 1, wherein  
the dihydroxy functionality of poly(trimethylene ether) glycol is about  
1.6 to about 2.0.
5.     A polyurethane or polyurethane-urea prepared from:  
20           (a)    poly(trimethylene-ethylene ether) glycol  
             (b)    diisocyanate; and  
             (c)    diol or diamine chain extender.
6.     A polyurethane as claimed in claim 5 wherein the diol chain  
25       extender is selected from the group consisting of ethylene glycol, 1,2-  
propylene glycol, 1,3-propanediol, 1,4-butanediol, 1,6-hexanediol,  
diethylene glycol, 2-methyl-1,3-propanediol, 3-methyl-1,5-pentanediol,  
2,2-dimethyl-1,3-propanediol, 2,2,4-trimethyl-1,5-pentanediol, 2-methyl-  
2-ethyl-1,3-propanediol, 1,4-bis(hydroxyethoxy)benzene,  
30       bis(hydroxyethylene)terephthalate, hydroquinone bis(2-hydroxyethyl)  
ether, and combinations thereof.

7. A polyurethane-urea as claimed in claim 5 wherein the diamine chain extender is selected from the group consisting of 1,2-ethylenediamine, 1,6-hexanediamine, 1,2-propanediamine, 4,4'-methylene-bis(3-chloroaniline), dimethylthiotoluenediamine, 4,4'-diaminodiphenylmethane, 1,3-diaminobenzene, 1,4-diaminobenzene, 3,3'-dimethoxy-4,4'-diamino biphenyl, 3,3'-dimethyl-4,4'-diamino biphenyl, 4,4'-diamino biphenyl, 3,3'-dichloro-4,4'-diamino biphenyl, and combinations thereof.

8. The polyurethane or polyurethane-urea of claim 5 wherein diisocyanate is selected from the group 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 4,4'-diphenylmethane diisocyanate, 4,4'-dicyclohexylmethane diisocyanate, 3,3'-dimethyl-4,4'-biphenyl diisocyanate, 1,4-benzene diisocyanate, trans-cyclohexane-1,4-diisocyanate, 1,5-naphthalene diisocyanate, 1,6-hexamethylene diisocyanate, 4,6-xylylene diisocyanate, isophorone diisocyanate, and combinations thereof.

9. The polyurethane or polyurethane-urea of claim 5 wherein the poly(trimethylene-ethylene ether) glycol has a number average molecular weight ranging from 250 to 10,000.

10. The polyurethane or polyurethane-urea of claim 9 wherein the poly(trimethylene-ethylene ether) glycol has a number average molecular weight ranging from 1,000 to 5,000.

11. The polyurethane or polyurethane-urea of claim 5, comprised of up to about 85 wt % poly(trimethylene-ethylene ether) glycol of the total weight.

12. The polyurethane or polyurethane-urea of claim 5 in which the ratio of total reactive groups contained in the poly(trimethylene-ethylene ether) glycol and chain extender components to the isocyanate groups is greater than 1.

5

13. The polyurethane or polyurethane-urea of claim 5 in which the ratio of total reactive groups contained in the poly(trimethylene-ethylene ether) glycol and chain extender components to the isocyanate groups is 0.8 to 1.

10

14. The polyurethane or polyurethane-urea of claim 1, wherein the poly(trimethylene-ethylene ether) glycol is blended with other polyether glycol(s).

15

15. The polyurethane or polyurethane-urea of claim 14, wherein the polytrimethylene ether glycol is blended with up to 50 weight % of other polyether glycol(s).

20

16. The polyurethane or polyurethane-urea of claim 8, wherein the other polyether glycol is selected from the group consisting of polyethylene glycol, poly(1,2-propylene glycol), polytrimethylene glycol, polytetramethylene glycol and combinations thereof.

25

17. The polyurethane or polyurethane-urea of claim 5, wherein the poly(trimethylene-ethylene ether) glycol comprises water soluble and water insoluble chains.

30

18. The polyurethane or polyurethane-urea of claim 17 wherein the water soluble chains are less than 1 wt % of total polymer.

19. The polyurethane or polyurethane-urea of claim 18 wherein the water soluble chains are less than 0.5 wt % of total polymer.

20. A diisocyanate-terminated polyether-urethane prepolymer prepared from:

- (a) poly(trimethylene-ethylene ether) glycol and
- (b) diisocyanate.

5

21. A process of producing diisocyanate-terminated polyether-urethane prepolymer comprising:

- (a) providing (i) diisocyanate and (ii) poly(trimethylene-ethylene ether) glycol having a number average molecular weight in the range of about 1,000 to about 5,000; and
- (b) reacting the diisocyanate and the poly(trimethylene-ethylene ether) glycol while maintaining an NCO:OH equivalent ratio of about 1.1:1 to about 10:1 to form the diisocyanate-terminated polyether-urethane prepolymer.

15

22. A process of producing polyurethane or polyurethane-urea comprising:

- (a) reacting (i) diisocyanate and (ii) poly(trimethylene-ethylene ether) glycol having a number average molecular weight in the range of about 1,000 to about 5,000 while maintaining an NCO:OH equivalent ratio of about 1.1:1 to about 10:1 to form diisocyanate-terminated polyether-urethane prepolymer;
- (b) reacting the diisocyanate-terminated polyether-urethane prepolymer with diol chain extender at an OH:NCO mole ratio of about 0.75:1 to about 1.15:1, or with diamine chain extender at  $\text{NH}_2$ :NCO mole ratio of about 0.85:1 to about 1.10:1, to form the polyurethane or the polyurethane-urea.

25  
30

23. The process of claim 17 further comprising curing the polyurethane or polyurethane-urea.

24. A process of producing polyurethane or polyurethane-urea comprising:

- (a) providing (i) diisocyanate, (ii) poly(trimethylene-ethylene ether) glycol having a number average molecular weight in the range of about 1,000 to about 5,000 and (iii) diol or diamine chain extender; and
- (b) reacting the diisocyanate, the poly(trimethylene-ethylene ether) glycol, and the diol or diamine chain extender to form the polyurethane or the polyurethane-urea.

25. A process of producing polyurethane or polyurethane-urea comprising:

- (a) providing (i) diisocyanate-terminated polyether-urethane prepolymer and (ii) diol or diamine chain extender; and
- (b) reacting the diisocyanate-terminated polyether-urethane prepolymer with the diol chain extender at an OH:NCO mole ratio of about 0.75:1 to about 1.15:1, or with diamine chain extender at  $\text{NH}_2$ :NCO mole ratio of about 0.85:1 to about 1.10:1, more to form the polyurethane or the polyurethane-urea.

26. A shaped article comprising the polyurethane or polyurethane-urea of claim 5.